

REMARKS

Applicant would like to thank the Examiner for the careful consideration given the present application. The application has been carefully reviewed in light of the Office action, and amended as necessary to more clearly and particularly describe the subject matter which applicant regards as the invention.

The Examiner rejected claims 1-5 under 35 U.S.C. 102(e) as being anticipated by Takenaka et al., U.S. Pat. No. 6,243,623. The Examiner's rejection is traversed for the following reason.

Applicant would like to remind the Examiner that on September 10, 2009 both the Examiner and the Examiner's supervisor informed Applicant, via telephone that Takenaka did not anticipate claim 1 of the present invention. Specifically, the Examiner and the Examiner's supervisor admitted that Takenaka did not teach "a first ground contact sensor and a second ground contact sensor being provided on the sole of the foot of each leg of the biped walking mobile body." The Examiner then informed Applicant that although he would have to perform one more final search, the Examiner indicated that he did not expect to find any relevant prior art based on his past searches. Thus, the Examiner indicated that he would issue a Notice of Allowance on September 10, 2009. Applicant would like to remind the Examiner that as of October 7, 2009 Applicant has not received a Notice of Allowance.

Therefore, Applicant maintains the argument from Amendment D, dated May 13, 2009, that Takenaka does not teach "a first ground contact sensor and a second ground contact sensor being provided on the sole of the foot of each leg of the biped

walking mobile body."

To reiterate, Takenaka teaches a control apparatus for a leg-type mobile robot that includes a six-axis force sensor 44. Referring to column 9, lines 1-8, and to FIGS. 1 and 2, the six-axis force sensor 44 is located between the ankle joint 18R(L), 20R(L) and the foot 22R(L) of each leg 2 and not on the sole of each foot, as required by claim 1 of the present invention.

Applicant, on the other hand, discloses a method of successively estimating the position of a floor reaction force acting point of each leg of a biped walking mobile body. The present invention accomplishes this with the use of first and second ground contact sensors provided on the sole of each foot. The first and second ground contact sensors can immediately estimate a horizontal position of a floor reaction force acting point based on whether a place directly below an ankle joint of a leg and a place directly below a metatarsophalangeal joint of the foot of the leg, respectively, are in contact with the ground. Further, the first and second ground contact sensors can immediately determine the position of each foot and also determine if the robot is in a single stance position or a double stance position. Thus, it is imperative that the first and second ground contact sensors are located on the sole of each foot, as will become evident from the explanation below.

Referring to page 5, line 16 through page 7, line 10, if the first ground contact sensor 51r (the sensor directly below the ankle joint 12) is in contact with the ground and the second ground contact sensor 51f (the sensor directly below the metatarsophalangeal joint 13a) is not in contact with the ground then the foot 13 is in the position as shown in FIG. 6(a) and the horizontal position of a floor reaction force acting point related to the leg will be substantially equal to the horizontal position of

the ankle joint 12. Similarly, if the second ground contact sensor 51f is in contact with the ground and the first ground contact sensor 51r is not in contact with the ground then the foot 13 is in the position as shown in FIG. 6(b) and the horizontal position of the floor reaction force acting point related to the leg will be substantially equal to the horizontal position of the metatarsophalangeal joint 13a. In addition, if both the first 51r and the second 51f ground contact sensors are in contact with the ground then the foot 13 is in the position as shown in FIG. 7(b) and the horizontal position of the floor reaction force acting point related to the leg will be substantially equal to the horizontal position of a center of gravity G0 of the mobile body.

Thus, the horizontal position of a floor reaction force acting point of each leg can be easily estimated by simply determining the position of the foot. As explained above, the position of the foot is simply determined through contact of the first and second ground contact sensors. This arrangement allows the horizontal position of a floor reaction force acting point to be estimated without using a data table, data map or the like, see page 8, line 23 through page 9, line 24 and specifically, lines 12-15 on page 9.

Referring to page 46, line 9 through page 47, line 2, as mentioned above, the first and second ground contact sensors can also determine if the robot is in a single stance position (FIG. 1(a)) or a double stance position (FIG. 1(b)). Specifically, if at least one ground contact sensor from one foot outputs an "ON" signal (at least one sensor is in contact with the ground) and neither sensor from the other foot output an "ON" signal (neither sensor is in contact with the ground) then the robot is in the single stance mode. Similarly, if at least one ground contact sensor from each foot outputs an "ON" signal (at least one sensor is in contact with the ground) then the

robot is in the double stance mode. This additional information is used to determine estimated values of floor reaction forces acting on each leg.

Thus, in the present invention, locating the ground contact sensors on the sole of each foot serves a specific purpose that cannot be achieved by locating a sensor between the ankle joint and the foot of each leg.

Based on the foregoing, it is apparent that Takenaka does not teach or suggest all the features of claim 1 and therefore cannot be cited as anticipating claim 1. Thus, reconsideration and withdrawal of the rejections of claim 1 based upon Takenaka are hereby requested.

Claims 2-5 depend from claim 1, thus, all arguments pertaining to claim 1 are equally applicable to these claims and are herein incorporated by reference.

In light of the foregoing, it is respectfully submitted that the present application is in a condition for allowance and notice to that effect is hereby requested. If it is determined that the application is not in a condition for allowance, the Examiner is invited to initiate a telephone interview with the undersigned attorney to expedite prosecution of the present application.

If there are any additional fees resulting from this communication, please charge same to our Deposit Account No. 18-0160, our Order No. SAT-16287.

Respectfully submitted,

RANKIN, HILL & CLARK LLP

By /Ronald S. Nolan/
Ronald S. Nolan, Reg. No. 59271
Patent Agent

38210 Glenn Avenue
Willoughby, Ohio 44094-7808
(216) 566-9700